United States Patent

[11] 3,584,628

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[45] Patented June 15, 1971

[73] Assignee United States Surgical Corporation
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[54] WIRE SUTURE WRAPPING INSTRUMENT
14 Claims, 19 Drawing Figs.

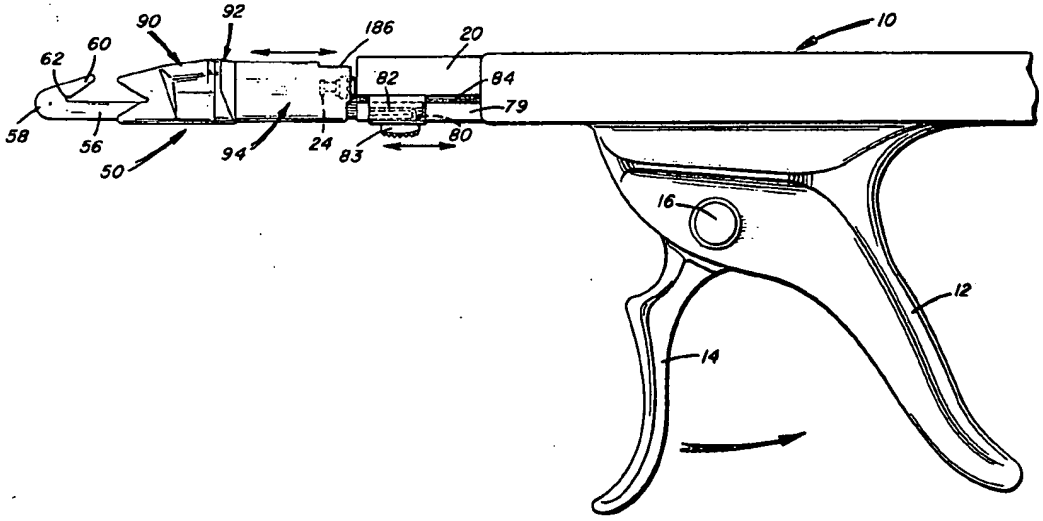
[52] U.S. Cl. 128/305, 128/326, 29/243.57
[51] Int. Cl. ..... A61b17/32, .A61b 17/12
[50] Field of Search 128/305, 326, 327, 324, 318, 319; 29/33.5, 243.57, 243.58, 211, 212; 227/19

[56] References Cited
UNITED STATES PATENTS

3,006,344	10/1961	Vogelfanger	128/318
3,079,608	3/1963	Babkin	29/243.57

Primary Examiner—Richard A. Gaudet
Assistant Examiner—G. F. Dunne
Attorney—Fleit, Gipple & Jacobson

ABSTRACT: A wire wrapping suturing instrument comprising a gun portion and a cartridge portion which is removable and disposable. The gun portion consists of a pair of relatively slidable spring biased push elements which cooperate with different parts of the cartridge portion. The cartridge portion consists of a rail assembly upon which is mounted a barrel holder, pusher guide body, and wrap cooperating with one of the push elements of the gun, and a pusher cooperation with the other push element of the gun. Cylindrical barrels containing a load of wire sutures are mounted in the barrel holder, and in successive operations of the instrument, the wire sutures are discharged from the barrels and wrapped about an organic tube for the purpose of clamping and suturing. A knife is provided to sever between sutured parts of the tube.



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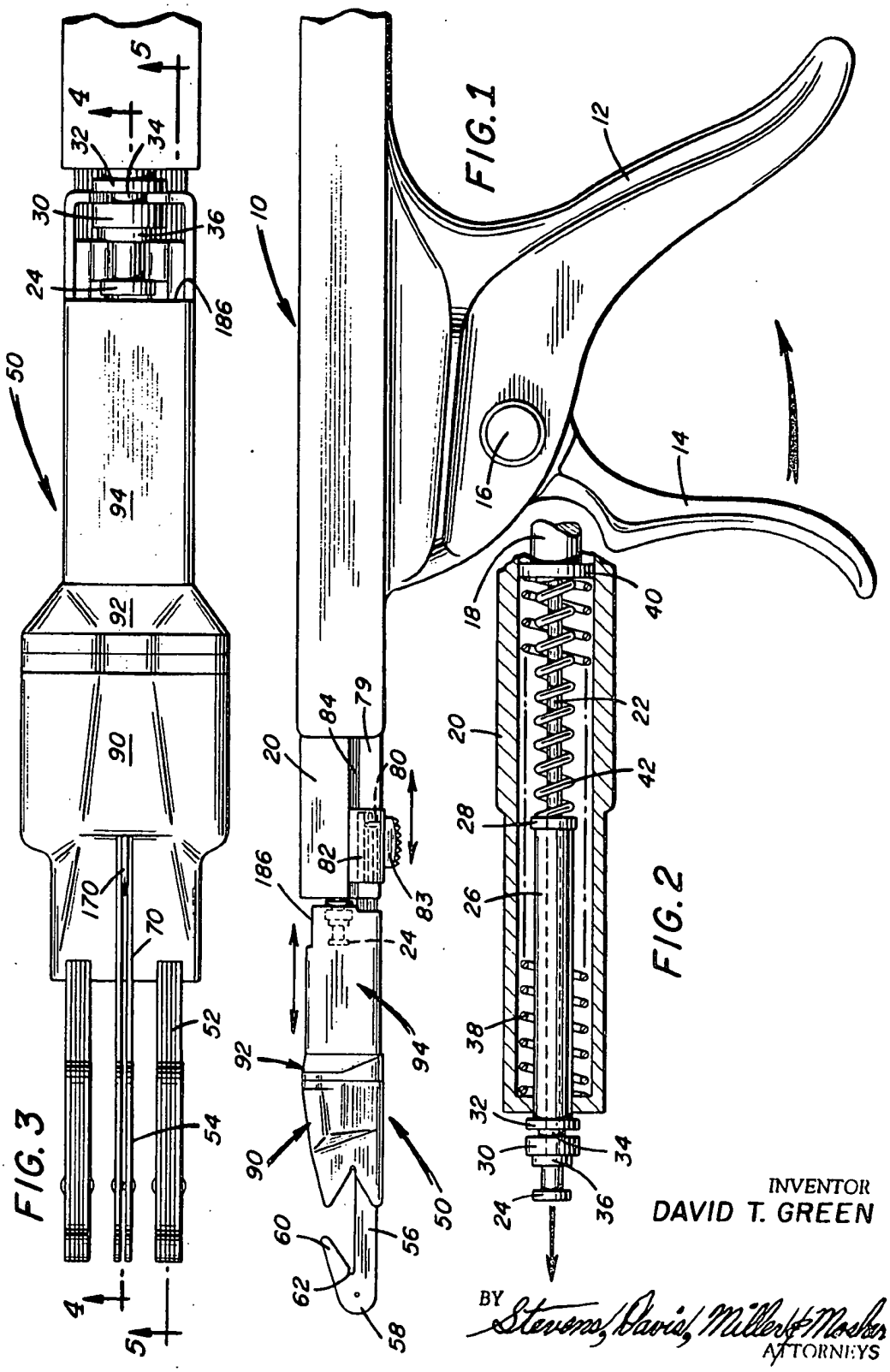
SHEET 1 OF 7



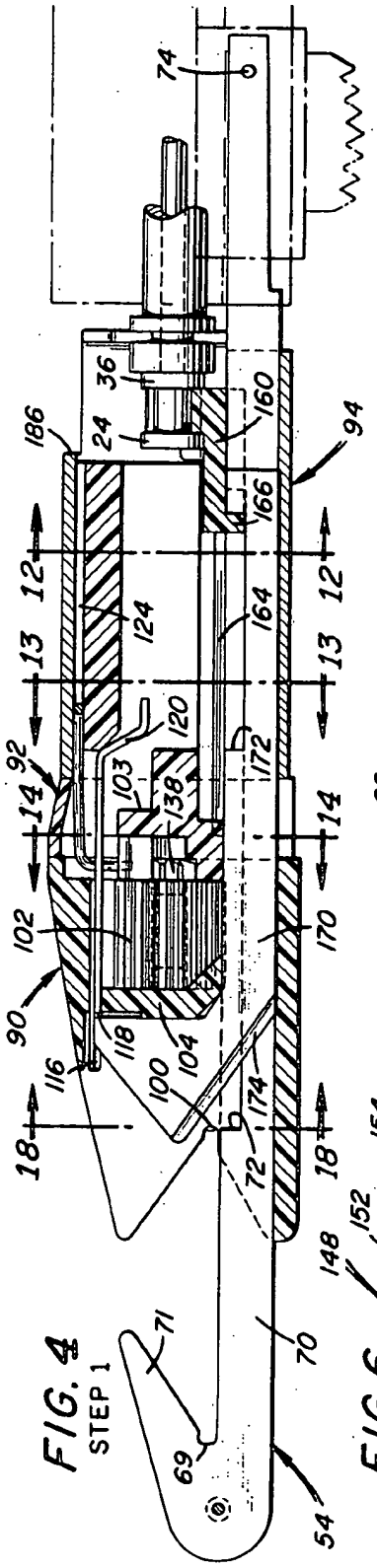


FIG. 4
STEP 1

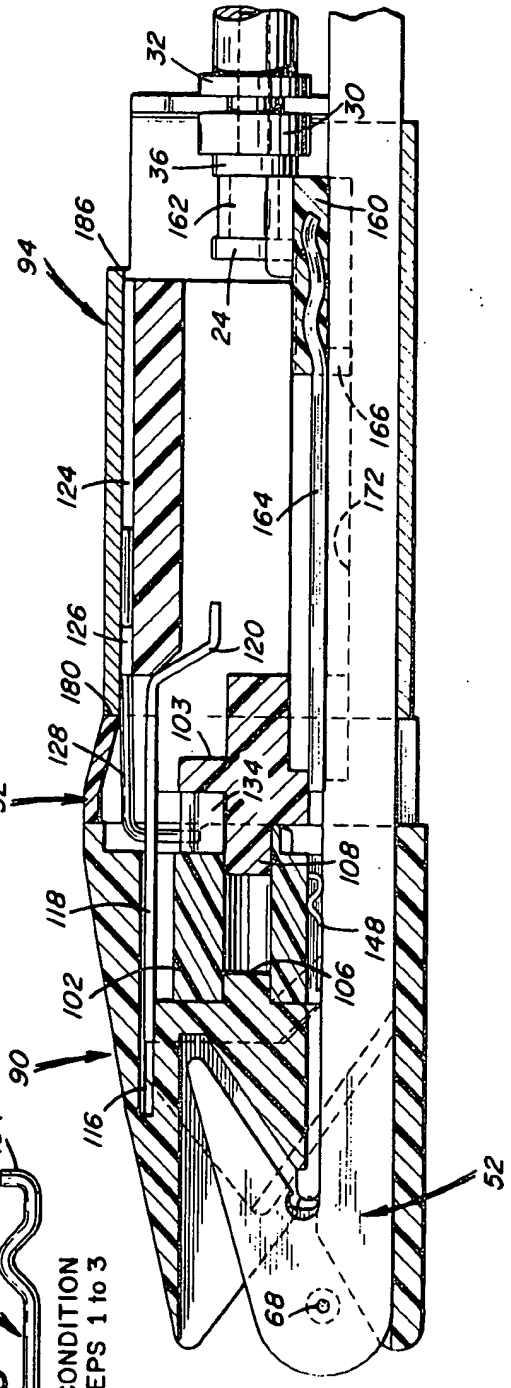


FIG. 5
STEP 2

FIG. 6
STAPLE CONDITION FROM STEPS 1 to 3

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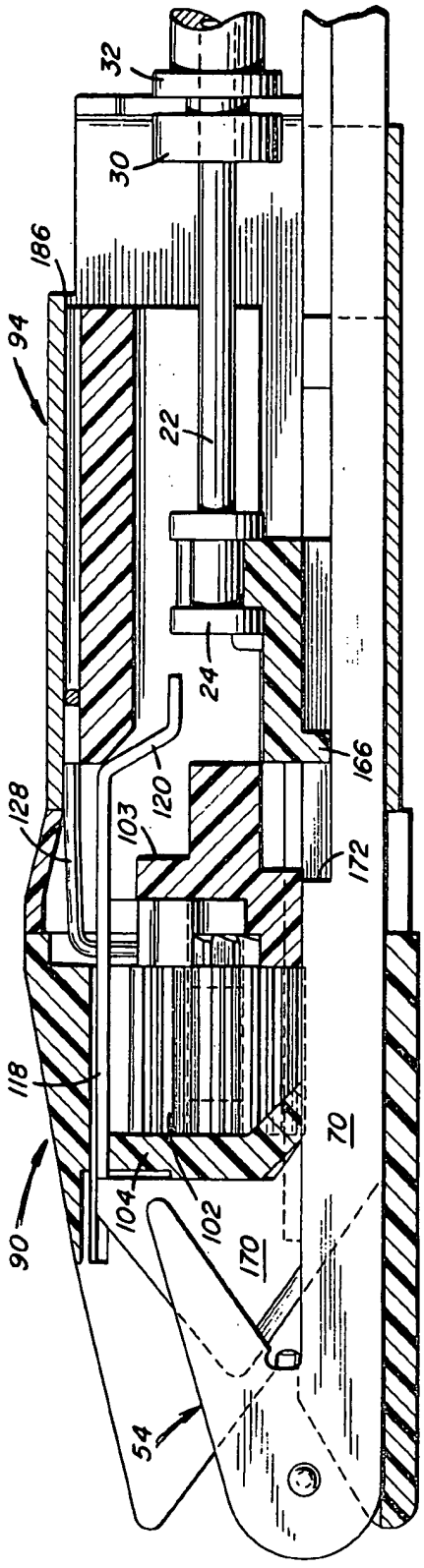

FIG. 7
STEP 3

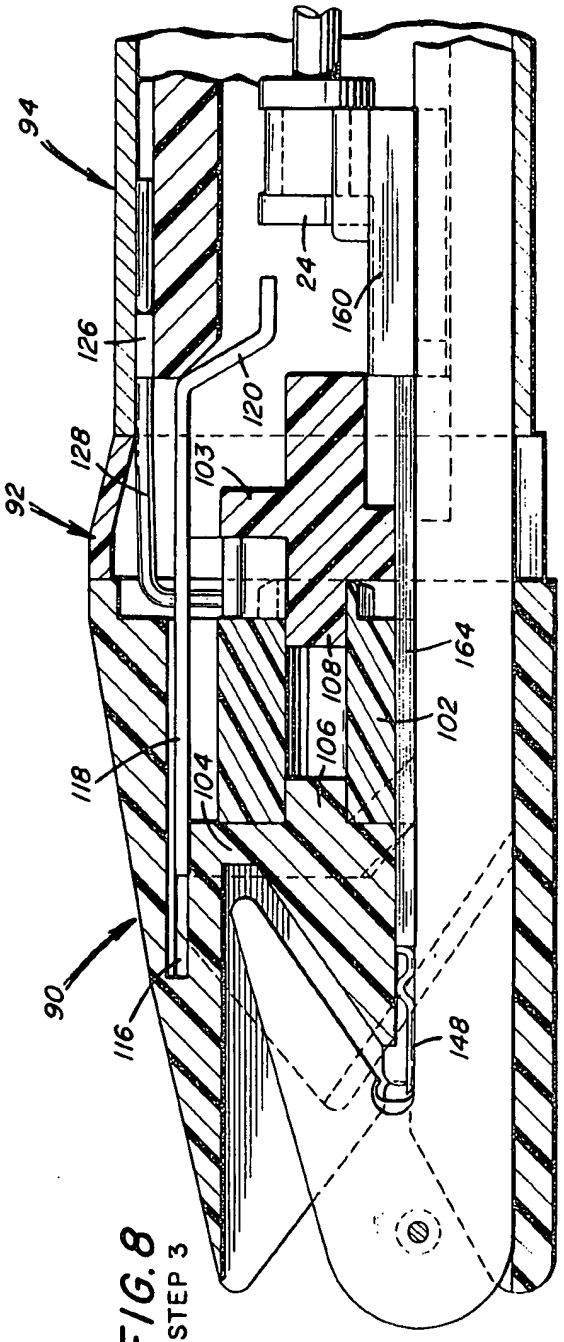

FIG. 8
STEP 3

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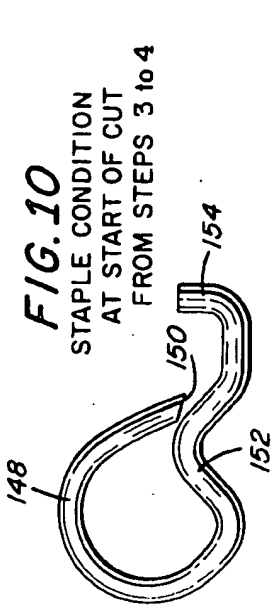

FIG. 10
STAPLE CONDITION AT START OF CUT FROM STEPS 3 to 4

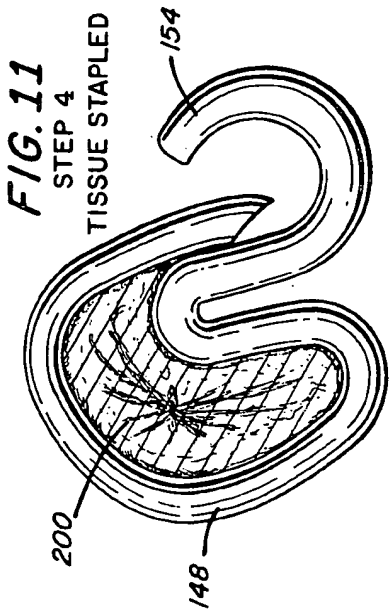

FIG. 11
STEP 4
TISSUE STAPLED

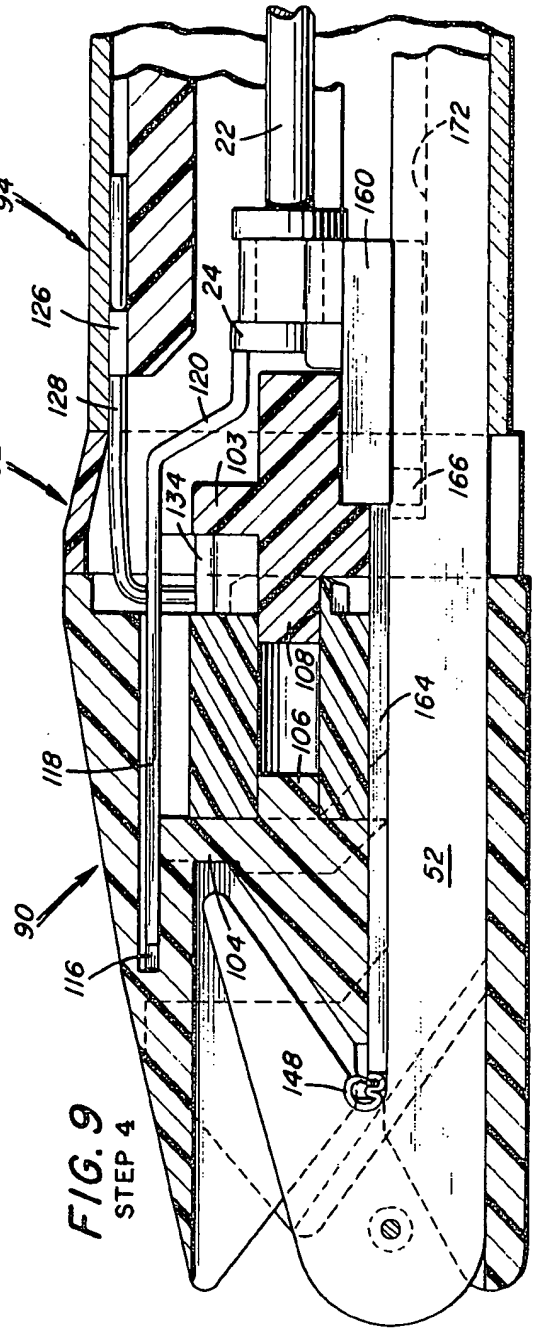

FIG. 9
STEP 4

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FIG. 12

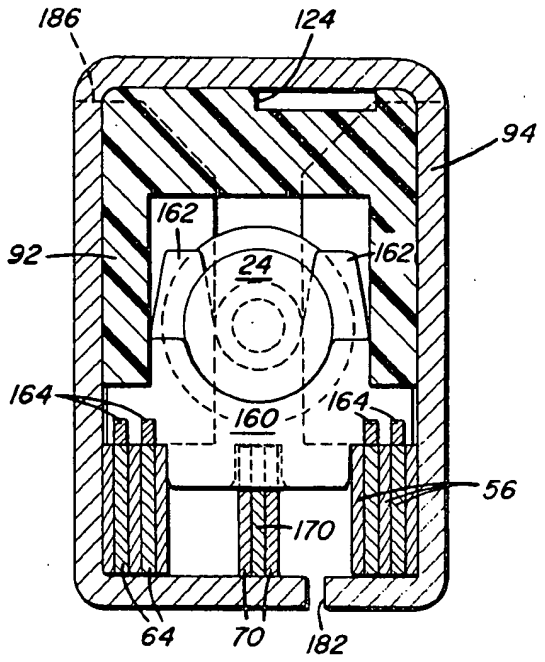

FIG. 13

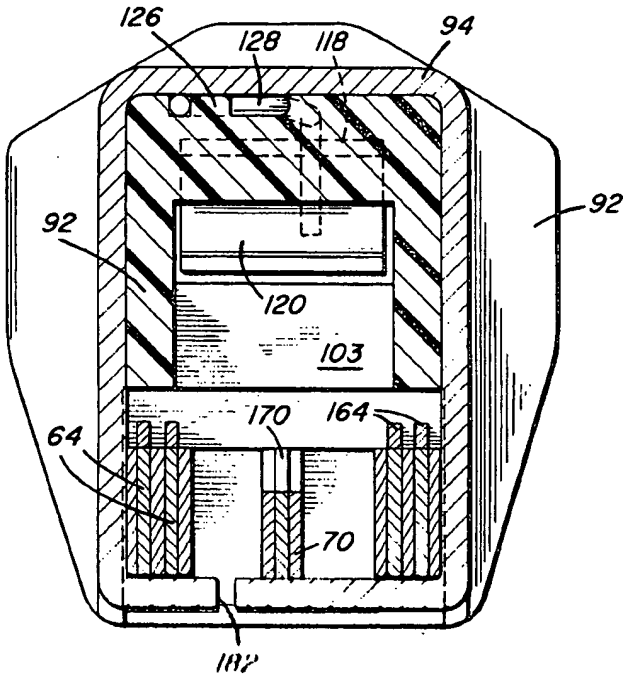

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FIG. 14

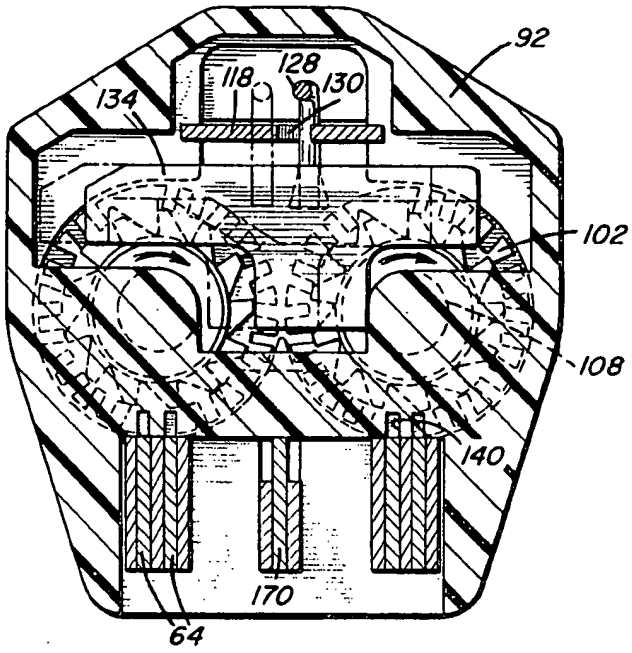


FIG. 15

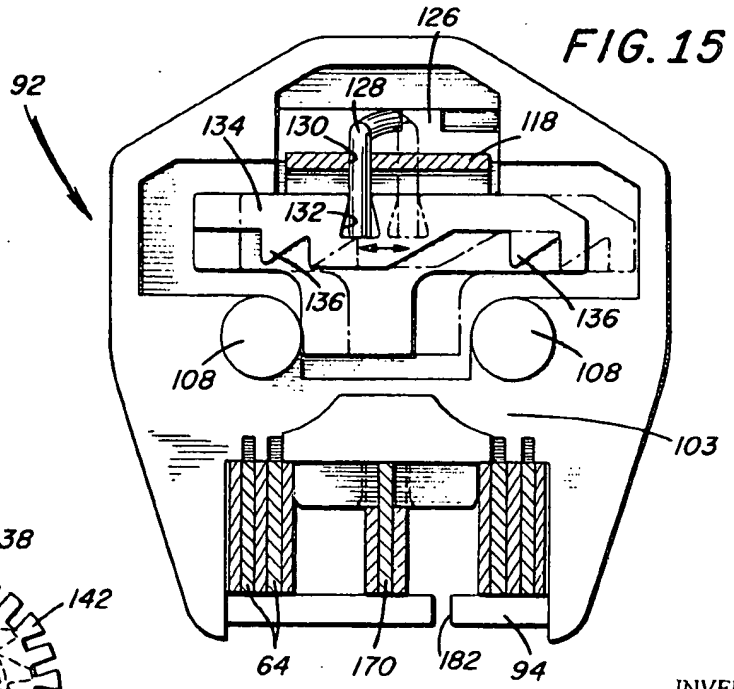
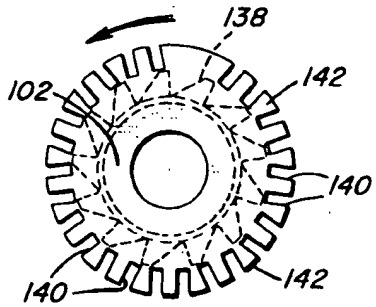


FIG. 16



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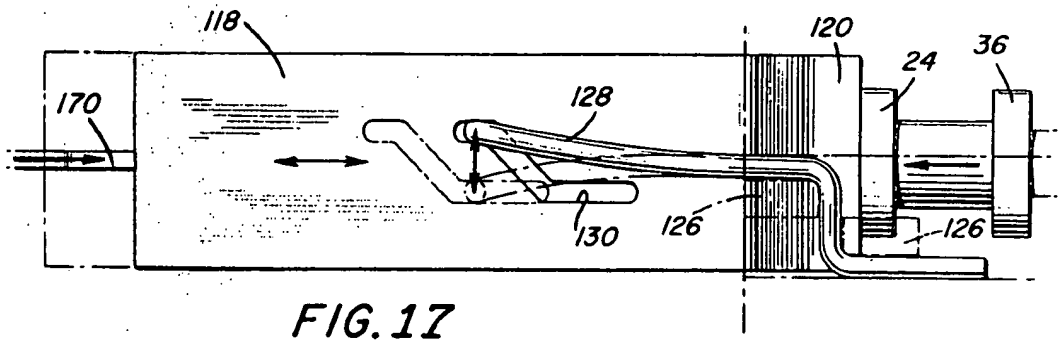


FIG. 17

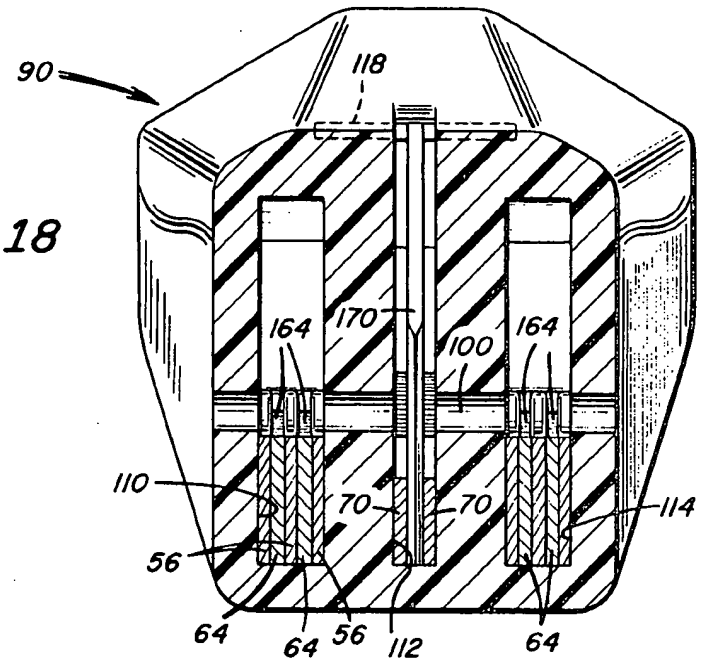
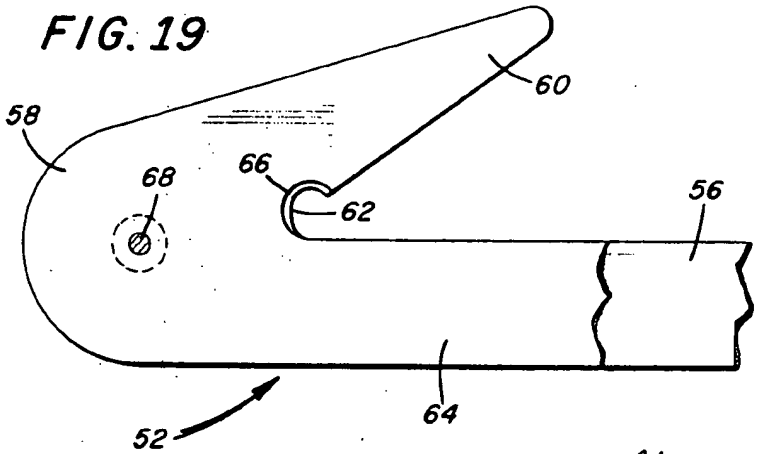


FIG. 18

FIG. 19



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WIRE SUTURE WRAPPING INSTRUMENT

CROSS-REFERENCE REFERENCE TO ANOTHER APPLICATION

The present invention is an improvement to the medical instrument shown and described in my copending application, Ser. No. 672,362, filed Oct. 2, 1967.

BACKGROUND OF THE INVENTION

The present invention relates to medical instruments for mechanically placing pairs of spaced steel sutures about organic tubular structures, such as mesenteric vessels, vagus nerves, or the like (hereinafter referred to as "tube"), and cutting the tube between the sutures in the same operation.

The problems of the art are described in my copending application identified as aforesaid, and the purpose of the present invention is to provide a medical instrument of this type which will be characterized by a greater degree of reliability during use. In addition, a further purpose of the present invention is to provide the medical instrument so that the cartridge portion of the instrument may be fabricated as a completely disposable unit. Further, the cartridge portion is designed to be readily and easily mounted on the gun portion of the instrument and demounted therefrom during surgical operative procedures.

SUMMARY OF THE INVENTION

Briefly stated, the present invention employs elongated wire sutures which are carried in a pair of barrels housed in a barrel holder which rides on a rail assembly. Anvils for the wire sutures are formed by parts of the rail assembly. A pusher guide body, including a pusher, also rides on the rail assembly and cooperates with the barrel holder. The pusher drives the wire sutures out of the barrels at an appropriate stage in the operation of the instrument. When first assembled onto the gun portion of the instrument, the cartridge is arranged with the barrel holder and pusher guide body retracted from the anvil. The tube to be sutured and cut is placed against the anvil, and the pusher guide body and barrel holder are, in the first stages of operation of the instrument, brought into proximity with the anvil in a manner that the barrel holder, cooperating with the anvil, clamps the tube in a fixed position. Responsive to a predetermined pressure developing upon the tube, the pusher within the pusher guide body commences to move relative thereto and causes the ejection of the wire sutures from the barrels driving them against the anvil surfaces. The wire sutures are guided by the anvils and wrapped about the tube effecting the required closures. Meanwhile, a knife within the instrument is driven forward between the sutured closures and severs the tube. Spring pressure restores the various cartridge elements to their initial condition during which movement the barrels are indexed for the next wire sutures.

It is, therefore, the object of the present invention to provide a new and improved suture wrapping instrument which operates with greater reliability and with greater ease than has heretofore been possible.

It is a further object of the present invention to provide a new and improved cartridge structure for a suture wrapping instrument which will enable mounting and demounting of the cartridge structure with greater ease and reliability, particularly during surgical operative procedures.

BRIEF DESCRIPTION OF THE DRAWING

Other and further objects of the present invention will become apparent with the following detailed description when taken in conjunction with the appended drawings in which:

FIG. 1 is a view in side elevation of the novel instrument of the present invention;

FIG. 2 is a view in section through the barrel of the gun portion of the instrument;

FIG. 3 is a view in top plan showing the cartridge portion of the instrument and the connection to the gun portion;

FIG. 4 is a view in vertical section taken along line 4–4 of FIG. 3 showing the initial condition of the cartridge;

FIG. 5 is a view in vertical section taken along line 5–5 of FIG. 3 showing the condition of the cartridge after the tube has been clamped;

FIG. 6 is a view of the elongated wire suture illustrating its original condition;

FIG. 7 is a view similar to FIG. 5, showing the position of the pusher after the wire sutures have been driven out of the barrels toward the anvil;

FIG. 8 is a view similar to FIG. 7, showing the condition of the wire sutures in more detail;

FIG. 9 is a view similar to FIG. 5, showing the condition of the cartridge while the wire suture is being wrapped around the tube;

FIG. 10 is an illustration of the wire suture showing its condition at the time the tube is being cut by the knife;

FIG. 11 is a view showing the condition of the wire suture after it has been fully wrapped and clamped about the tube;

FIGS. 12, 13, 14 and 18 are sectional views taken along lines 12–12, 13–13, 14–14, and 18–18, respectively, of FIG. 4;

FIG. 15 is a view partially in section showing the forward end of the pusher guide body showing the relationship of the cam plate and ratchet bar;

FIG. 16 is a representative illustration showing a barrel and the relationship between the slots in the periphery of the barrel and the teeth at the end of the barrel which cooperate with the ratchet bar;

FIG. 17 is a top view showing the operation of the cam plate; and

FIG. 19 is a fragmentary view showing the end of the anvil.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the figures of the drawing, the preferred embodiment of the present invention comprises the following. As shown in FIG. 1, the medical instrument generally comprises a gun portion 10 and a cartridge portion 50. The gun portion consists of a handle 12 provided with a trigger 14 pivotally mounted about pin 16. The upper end of the trigger 14 is mechanically connected with rod 18 which reciprocates within barrel 20 of the gun. A rod 22 forms an extension of rod 18 and projects out of the barrel 20 having a collar 24 fixed to its free end. A sleeve 26 is slidably mounted on the rod 22 and has a collar 28 fixed at one end and a pair of spaced collars 30 and 32 fixed at its other end. The portion 34 of the sleeve 26 intermediate the collars 30 and 32 has a slightly reduced diameter. A collar 36 is fixed onto the rod 22 in spaced relation to the collar 24 and prevents the sleeve 26 from falling off the rod 22.

As will be noted from FIG. 2, the sleeve 26 projects out from the end of the barrel 20, and the space within the barrel defined between its end and the rod 18 has mounted therein a main compression spring 38 which bears between the end of the barrel 20 and a collar 40 fitted onto the rod 18, which collar 40 has a diameter substantially equal to the inside diameter of the barrel 20. Therefore, the spring 38 tends to drive the rod 18 to the right as illustrated in FIG. 2, or to retract the rod 22. Further, a secondary spring 42, also a compression spring, bears against collar 28 at one end and collar 40 at its other end, tending to force the sleeve 26 toward the collar 36.

The cartridge portion 50 of the instrument comprises a rail assembly which consists of three parts, two anvil parts 52 and a knife guide part 54. Each anvil part 52 consists of a laminated construction comprised of five plates. The two outside plates and the middle plate 56 are all of identical construction and consist of an elongated plate terminating in an anvil portion characterized by a rounded end 58 and an acutely projecting return part 60. The apex of the projecting part 60 of the plate 56 is cut out as indicated by the reference numeral 62. The intermediate plates 64 actually constitute the anvil surfaces and have the same structure as the plates 56, namely, the rounded end 58 and the acutely projecting return part 60,

and differ only in that the cutout 66 anvil surface at the apex is of a slightly larger radius so that when the plates are stacked in the form shown in the drawings, in particular FIG. 3, the cutouts 62 of the plates 56 will form a channel or groove about the cutouts 66 (anvil surface) of the plates 64. These grooves will be anvil guides for the wire sutures. The stack of plates 64 and 56 is held together at its free end by means of a pin 68.

The knife guide part 54 is comprised of a pair of plates 70 which have a return part 71 and cutout 69 and are similar to the plates 64 and 56. Plates 70 also have a cutout portion 72 for a substantial part of their length. The other ends of the two anvil parts 52 and the knife guide part 54 are fastened together by means of spacers and pin 74 which projects slightly at either end. The spacers are not illustrated in the drawing, but they comprise plastic blocks fitted in between the parts 52 and 54 to maintain the spacing illustrated in FIG. 3, and the pin 74 binds this end of the assembly rigidly together. By this means, a mounting is provided for the cartridge portion 50 to the gun portion 10.

Beneath barrel 20, the gun portion 10 is provided with a housing 79 to receive the rail assembly. The housing 79 has a slot 80 into which the projecting ends of the pin 74 are received when it is desired to mount the cartridge portion to the gun portion. A guard 82 is slidably mounted onto the gun portion 10 to lock the rail assembly of the cartridge portion in the housing 79 of the gun portion with the ends of pin 74 received in the slot 80. Thus, the rail assembly of the cartridge portion is cantilever supported by the gun portion. The guard 82 is provided with a projection 83 having a knurled surface so that the guard 82 may be operated manually with that least amount of effort. Grooves 84 are defined on opposite sides of the housing 79 just below the barrel 20 and these grooves 84 receive bent-in edges of the guard 82 in a conventional manner.

The remainder of the cartridge portion is carried on the rail assembly and consists of a barrel holder 90, a pusher guide body 92, a pusher within the pusher guide body 92, a wrap 94, barrels, a cam plate and cam follower, and a ratchet bar cooperating with the barrels.

The barrel holder 90 is the forwardmost piece mounted onto the rail assembly and consists of an annular structure made of plastic which is characterized by the following features. The forward end of the barrel holder is formed in the shape of a V to cooperate with the acutely rearwardly projecting parts 60 and 71 of the rail assembly. The apex of the V is cut out as indicated by the reference numeral 100. A wall portion 104 divides the interior of the barrel 118 90 longitudinally, and a pair of studs 106 projects normally from the wall 104 in a rearward direction for the purpose of receiving one end of each of two barrels 102. The other end of each of the barrels 102 is carried by studs 108 defined by the pusher guide body. Studs 108 are best illustrated in FIG. 15, which is a view looking at the face of the pusher guide body from the barrel holder. The barrel holder 90 is further provided with a series of three slots 110, 112, and 114 which accommodate the anvil parts 52 and knife guide part 54, and also accommodate parts of the pusher as will appear evident from the following description. In this fashion the barrel holder is mounted on the rail assembly and is adapted to slide relative thereto.

The barrels 102 are mounted on the studs 106 and 108 in such a manner that the periphery of the barrels substantially c contacts the upper surface of the anvil parts 52. The barrel, holder 90 at its top is further provided with a slot 116 for the purpose of receiving in sliding contact a cam plate 118 which extends from the barrel holder 90 back towards the pusher guide body. The rear end 120 of the cam plate 118 is bent downwardly with the extreme end portion bent to a horizontal position whereby it may be contacted by the collar 24 fixed to the end of push rod 22 during its forward travel.

The pusher guide body 92 is comprised of two portions, the rear portion being an inverted U-shape with the legs of the U resting upon the anvil parts 52 and the forward portion comprised of a flared section, the extreme end of which has a cross section substantially corresponding to that of the barrel holder. The flared section includes a wall section 103 upon which studs 108 are formed. The upper surface of the rear portion of the pusher guide body 92 contains a cutout portion 124 in the form of a longitudinally extending slot. Positioned at offset spaced locations in the slot is a pair of blocks 126. A cam follower 128 in the form of a spring lies in the slot 124 formed in the upper surface of the pusher guide body with its rear end containing a pair of opposite right-angle bends so that it fits about the blocks 126 in the manner best illustrated in FIG. 17 so that the rear end is locked in a fixed position The forward end of the cam follower 128 is characterized with a right-angle bend so that it depends downwardly and fits through the cam slot 130 of the cam plate 118. The extreme lower end of the cam follower 128 is received within a dovetail slot 132 defined in the top surface of ratchet bar 134. This is best shown in FIG. 15.

The ratchet bar 134 comprises a horizontal member with a centrally depending vertical member which fits between the studs 108 formed by the pusher guide body 92. The lower surface of the horizontal member is provided with teeth 136 which mate with teeth 138 formed on the rear end of the barrels 102. The peripheries of the barrels 102 define a plurality of slots 140 which are arranged in pairs, with each pair being separated by a portion 142 at the periphery of the barrel 102 which is generally trapezoidal in cross section. In this way, slots 140 will be arranged in sets of two parallel slots.

Each slot of each barrel 102 when originally assembled contains a wire suture of the type illustrated in FIG. 6. The wire sutures are comprised of a stainless steel sterilizable wire, the forward portion of which terminates in a point 150. A bend or hump 152 is formed adjacent its rear end 154 which itself is defined by a right-angle bend. A wire suture 148 is shown in position in a barrel in FIG. 5.

Mounted within the pusher guide body is a pusher comprised of a block 160 having formed integrally thereon a saddle 162. Embedded in the block 160 is one end of each of four push rods 164. The embedded ends of the push rods 164 are waved or crinkled or otherwise deformed to increase the strength of the connection with the block 160. The push rods 164, as well as the block 160, ride on the upper surface of the rail assembly. A pad 166 depends from the forward end of the block 160 in the space defined between the plates 70. Also mounted between the plates 70 is a knife plate 170, which is provided with a cutout 172 in which the depending pad 166 rides. The forward end of the knife plate 170 is V-shaped with the lower portion defining a knife edge 174 and the upper portion lying in the same plane as the cam plate 118.

The wrap 94 is annular in configuration and is made of sheet metal fitting around the pusher guide body and bearing against a shoulder 180 defined by the pusher guide body. The wrap 94 is bent from a single piece of metal with the edges of the metal defining a slot 812 which is offset from the midplane of the wrap as will be evident from the sections illustrated in FIGS. 12 and 13. The wrap 94, since it encompasses the pusher guide body 92, serves to tie together the pusher guide body, the pusher, and the rail assembly. The rear portion of the top surface of the wrap 94 is cut out as indicated by the reference numeral 186, and the rear surface of the wrap 94 is comprised of tabs which define between them a slot sized to fit between the collars 30 and 32 and engage or fit closely with the smaller diameter portion 34 of the sleeve 26. Thus, to fit the cartridge portion onto the gun portion, it is located in proximity just beneath the gun portion so that vertically elevating the cartridge portion will result in the rear end of the rail assembly being received in the housing 79 just below the barrel 20 with the projecting ends of the pin 74 received in the slot 80. During this vertical movement of the cartridge portion, the rear end tabs of the wrap 94 will fit between the collars 30 and 32 and closely fit with the reduced diameter section 34 of the sleeve 26. Also, as the rear portion of the top surface of wrap 94 is cut out, the forward end of push rod 22 will pass into wrap 94 and be received in the saddle 162 of the pusher with

the collars 24 and 36 to either end. During this vertical placement of the cartridge portion onto the gun portion, the guard 82 will be retracted to the right as viewed in FIG. 1, and, upon placement of the cartridge portion onto the gun portion as aforesaid, the guard 82 will be moved to the left as viewed in FIG. 1 to lock the cartridge portion in position. At this time, the instrument is fully assembled and ready for use and is in the condition depicted in FIGS. 1 and 4.

To comprehend as fully as possible the present invention, the operation of the instrument will now be described. Operation of the instrument is carried out by pivoting the trigger 14 in the direction indicated by the arrow in FIG. 1. Grasping the gun portion in one hand, placing the fingers on the trigger 14 and squeezing produces the desired result. The medical instrument now performs its forward stroke, the steps of which are successively illustrated in FIGS. 4, 5, 7, 8, and 9. The condition of the instrument at the beginning of the forward stroke is portrayed in FIG. 4. The barrel holder 90, the pusher guide body 92, the wrap 94, the pusher, and the knife all begin to move as a coordinated unit toward the free end of the rail assembly. No relative movement between these parts occurs at the beginning of the stroke because the spring 42 forces the sleeve 26 to follow the movement of the push rod 22. It will be borne in mind, however, that prior to operation of the trigger 14 a tube to be sutured and severed will have been placed in the cutouts 62, 66 and 69 at the apexes of the rail assembly.

As the forward stroke progresses, the cartridge portion will eventually arrive at the condition as illustrated in FIG. 5. At this time, the entire assembly has moved into a relative juxtaposition with respect to the free end of the rail assembly such that the cutout 100 of barrel holder 90 defines with the cutouts 62, 66 and 69 a tissue gap within which is clamped the tube undergoing the surgical procedure. The trigger 14 at this time has only partially executed its pivotal movement and continued rotation of trigger 14 results in pressure-clamping pressure-developing on the tube now clamped in the tissue gap. When the clamping pressure reaches a predetermined level and is balanced by the force of spring 42, the sleeve 26 will cease to move forward and the push rod 22 will continue the forward stroke by itself.

The instrument now commences the third step as depicted in FIGS. 7 and 8. During this step the push rod 22, by virtue of the saddle 162, will move the pusher and push rods 164 forward relative to the barrel holder 90 and the pusher guide body 92. As will be noted from the drawings, the wall section 103 of the pusher guide body defines slots corresponding in shape to the push rods 164 so that they may pass through the pusher guide body and be received in the slots 140 defined by the barrels 102. The cross section of the pusher rods 164 exactly matches the cross section of the slots 140 so that the push rods 164 can move through the barrels, during which travel the forward ends of the push rods pick up and carry before them the wire sutures 148 contained in the respective slots 140. It will be recalled that the wire sutures are so oriented that their bent ends 154 will present an appropriate pushing surface to the push rods 164.

The surgical instrument is now in the condition as illustrated in FIGS. 7 and 8 and the wire sutures having been pushed free of the barrels 102 with the forward ends of the wire sutures being presented to the anvil surfaces defined by the cutouts 66. Recalling at this juncture that the adjacent plates 56 define cutouts 62 of slightly lesser radius so that the anvil surfaces lie at the bottom of a groove, the wire sutures receive positive guiding. During the foregoing portion of forward stroke, the pad 166 is riding in the cutout 172 of the knife plate 170 and, consequently, the knife plate 170 remains stationary. Likewise, the cam plate 118 is in the position shown in FIGS. 7 and 8 and has yet to be contacted by the advancing collar 24 on the forward end of the push rod 22.

The trigger 14 continues to rotate in the same sense as indicated by the arrow in FIG. 1 until the extreme forward end of the stroke is achieved, whereupon the parts occupy the positions illustrated by FIG. 9. During the final portion of the forward stroke, which takes place between FIGS. 8 and 9, the push rods 164 continue their forward travel forcing the wire sutures to first have their forward ends bent about the tube, being guided by the anvil surface defined by the cutouts 66, until the forward end 150 of the wire sutures has completed a loop and lies between the hump 152 and the other end 154, whereupon the wire suture is then compressed by the hump 152 being collapsed. The initial bending of the wire sutures is illustrated by FIG. 10, whereas the final bending and clinching is illustrated by FIG. 11. In FIG. 11, the tube clamped by the wire suture is designated by the reference numeral 200.

During this further forward movement of the pusher, the pad 166 strikes the forward edge of the cutout 172 carrying the knife plate 170 forward and causing the knife edge 174 to sever the tube 200. This occurs during the final clinching of the wire suture. Also, the collar 24 at the end of the push rod 22 strikes against the cam plate 118 moving this cam plate 118 forward in the slot 116 defined in the barrel holder 90. Forward movement of the cam plate 118 results in the cam follower 128 moving sideways causing, in turn, the ratchet bar 134 to be shifted to the side, but during this movement of the ratchet bar, the barrels do not rotate because the teeth 136 slip over the teeth 138 while the push rods 164 assist in maintaining the barrels stationary. In effect, what the cam plate 118 has accomplished is to cock the ratchet bar 134 to produce the required indexing during the return stroke.

The foregoing completes the description of the forward stroke of the instrument. As will be duly noted, four push rods 164 are shown, two for each barrel 102. Also, as previously noted, the slots 140 of each barrel 102 are arranged in pairs with the net result that a pair of wire sutures are clamped about the tube on either side of the knife cut. Whereas this arrangement provides the greatest reliability, nevertheless, the use of a single wire suture on either side of the knife cut is not to be precluded from the broadest purview of the invention.

The return stroke of the instrument is accomplished simply by releasing the trigger 14, whereupon the springs 38 and 42 will perform the following movements. The spring 38 will cause the push rod 22 to be retracted, whereupon it will withdraw the push rods 164 from the anvils and then from the barrels 102. During this movement, the pad 166 will ride to the other end of cutout 172 (a lost motion effect), whereupon it will pick up the knife plate 170 and start to withdraw it along with the push rod 22. When the knife plate has been sufficiently withdrawn, it will strike the wall 104 of the barrel holder 90 and also the forward end of the cam plate 118, causing it also to be retracted. During retraction of the cam plate 118, the cam follower 128 will cause the ratchet bar to be shifted to its original position, during which movement the barrels 102 will be indexed to present a fresh pair of slots 140 containing wire sutures. The purpose of the vertically depending member of the ratchet bar will now become evident, since movement of the ratchet bar 134 during the return stroke will cause it to assume the position as shown in FIG. 15 with one edge of the vertical member abutting against one of the studs 108. By these means the ratchet bar 134 will assume a very positive position so that proper indexing of the barrels 102 will be achieved each time. Continued rearward movement of the push rod 22 via knife plate 170 will bring all the parts back to the point where the collar 30 on the end of sleeve 26 abuts against the collar 36 and the cartridge rides back along the rail assembly to the position generally illustrated in FIG. 4, whereupon the instrument will be ready for a further use.

Although the present invention has been shown and described in terms of a specific embodiment, it will be appreciated that changes and modifications may be made which do not depart from the inventive concept herein disclosed.

What I claim is:

1. A surgical instrument for placing a medical suture about an organic tubular structure comprising a gun portion and a cartridge portion mounted thereon, said cartridge portion comprising a rail assembly including a pair of parallel spaced anvil parts defining anvils with knife guide means extending in

between and parallel thereto, medical suture means carried on said rail assembly in sliding relationship therewith and including a plurality of substantially linear wire sutures ejectable therefrom, a pusher cooperating with said linear wire sutures ejectable therefrom, a pusher cooperating with said linear wire sutures, along the longitudinal axis thereof, to eject said linear wire sutures therefrom and to drive same against said anvils to cause said linear wire sutures to wrap about an organic tubular structure held against said anvils, said pusher having a cross section substantially equal to that of said sutures, a knife cooperating with said pusher for severing the tube held against said anvils, said gun including push elements cooperating respectively with said medical suture means and said pusher, means for initially moving said medical suture means and said pusher into proximity with said anvils to hold a tube against said anvils, means for thereafter moving said pusher to eject linear wire sutures from said medical suture means and drive same against said anvils to wrap same about the tube held thereagainst at spaced locations and means for moving said knife to sever the tube between the wire sutures wrapped about the tube.

2. A surgical instrument as defined in claim 1, wherein said medical suture means includes a pair of barrels, each having slots in its periphery and in which slots are carried the plurality of wire sutures.

3. A surgical instrument as defined in claim 2, further including index means for rotating said barrels.

4. A surgical instrument as defined in claim 2, wherein said pusher includes elongated pusher rods for driving wire sutures from said barrels.

5. A surgical instrument as defined in claim 1, wherein said spaced anvil parts each comprise an anvil surface bounded with guiding portions.

6. A surgical instrument as defined in claim 1, wherein the push elements of said gun comprise a push rod spring biased for retraction into the gun and a sleeve carried on said push rod spring biased for projection out of the gun and a stop means on the push rod to limit the outward travel of said sleeve.

7. A surgical instrument as defined in claim 1, wherein said medical suture means includes a barrel holder and a pusher guide body in end-to-end abutting relationship and a pair of barrels rotatably position therebetween, each said barrel containing a plurality of said wire sutures, and said pusher including push rods to eject wire sutures from said barrels.

8. A surgical instrument as defined in claim 7, further including index means for rotating said barrels.

9. A surgical instrument as defined in claim 8, wherein said index means includes teeth formed on said barrels, a ratchet bar cooperating with said teeth, and cam means for actuating said ratchet bar.

10. A surgical instrument as defined in claim 9, wherein said cam means includes a cam plate defining a cam slot and a cam follower riding in said cam slot and engaging said ratchet bar.

11. A surgical instrument as defined in claim 8, wherein a wrap encloses said pusher guide body and bears against the shoulder thereon.

12. A surgical instrument as defined in claim 1, wherein said knife includes a lost motion cutout so that said pusher, during the forward stroke, drives said knife after a predetermined movement of said pusher.

13. A surgical instrument as defined in claim 12, wherein said pusher, during the return stroke, withdraws said knife against said medical suture means causing same to be slidably retracted along said rail assembly.

14. A surgical instrument as defined in claim 1, wherein said anvil parts each comprise a stack of five plates with the second and fourth plate of the stack constituting the anvil surfaces and the first, third, and fifth plate of the stack defining boundaries for the anvil surfaces so that the latter lie in the bottom of a groove.